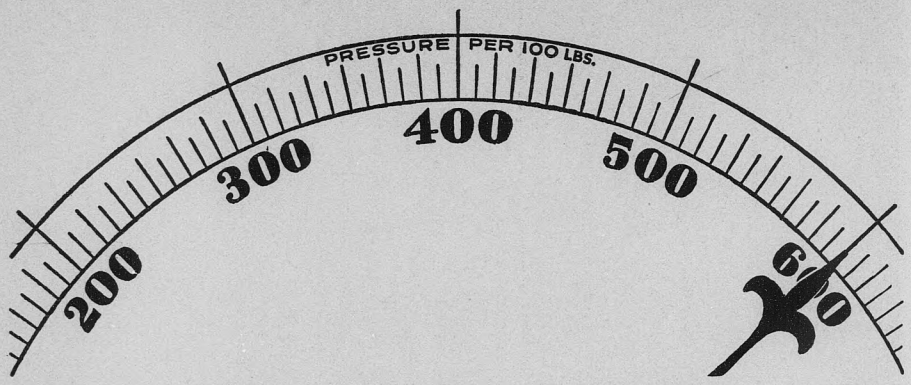
The Maryland Fruit Grower

April, 1932

Maryland State
Horticultural Society



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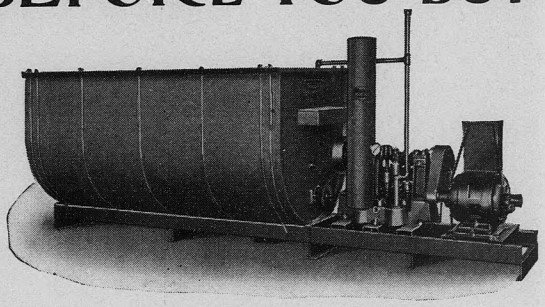

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OBTAINING HONEY BEES FOR ORCHARD POLLINATION

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There are three practical methods of obtaining bees for pollinating purposes. Each method has certain advantages and each, under certain conditions is the most desirable. Colonies may be rented from a local beekeeper, colonies may be bought from a local beekeeper, or package bees may be purchased from the southern states.

RENTING

Under most conditions and especially in large orchards where the fruit grower does not wish to manage bees himself, it is the best policy for him to rent colonies of bees from a nearby beekeeper. Most orchardists have neither the time nor the inclination to work with bees. Furthermore they are not qualified by experience or training to properly manage an apiary. They do not wish to spend their time and energy in the study and practice necessary to enable them to do this work. Renting bees eliminates these difficulties and relieves the orchardist of all managerial duties, and places the entire responsibility and burden on the beekeeper.

Renting colonies merely means that for a cash consideration per colony a beekeeper will supply the orchardist with the desired number of colonies for the period of fruit bloom. To the orchardist it is just that simple. However, to the beekeeper the transaction is not as simple, and uninvolved as it may seem, and it is well for the orchardist to know just what he can rightly demand of a beekeeper and to understand the difficulties, risks and expenses which confront the beeman.

To one unfamiliar with apiary management and practices, a cash price paid to a beekeeper for the use of colonies, may seem like a gift. It is often argued that the beekeeper in moving his bees into an orchard, secures an ideal location for his colonies and receives benefits in honey production which should repay him for the use of his bees. The orchardist is misled by the sight of a sea of blossoms in his orchard. It seldom happens that a beekeeper produces more honey by moving his bees into an orchard than he would make on his home stand from dandelions and local fruit trees.

The labor involved in preparing colonies to be moved is considerable. Colonies to be rented must be unpacked and examined earlier in the season

than is normally the case. This often causes considerable losses by exposing developing broods. However, colonies *must* be opened and examined for several reasons. In order to protect the fruit man the colonies must be inspected for strength so that he will not be charged for values not received. Colonies must be inspected for bee diseases so as not to spread disease to apiaries which may be located near the orchard. Frames must be nailed tight and the hives securely screened. The work must be done at night. The heavy lifting involved requires that the beekeepr have a helper. The actual moving is usually done at night and may involve many trips.

The beekeeper runs a number of risks in moving his bees. There is the possibility of his bees acquiring disease, while at their new stand in the orchard. Should his colonies become generally infected the whole renting proposition would be turned into a loss.

There is always the possibility of his bees getting loose in transit and causing annoyance or damage resulting in law suits. This legal aspect is not imaginary, but has happened on numerous occasions.

Colonies moved into a region of orchards are exposed to the hazards of poisoning by sprays and dusts. While there should be no danger from this source, if sprays or dusts are properly applied, it often happens that improper spraying or dusting while the bees are working on the trees, causes severe losses. Of the two, dusting is the most likely to cause trouble as the dust particles are carried by air current and are collected by bees on their bodies while in flight.

The beekeeper is always confronted by the possibility of loss through vandalism in moving bees into unprotected and semi-remote situations. It is sometimes a lucrative evening's work to rob colonies of their honey and is often looked upon as good sport.

Should no losses be incurred from the above mentioned possibilities, the beekeeper is certain to suffer considerable loss in the transportation of his colonies. Regardless of the care taken in moving colonies, they usually experience a varying percent of mortality from becoming overheated while in transit. The jarring involved in loading and unloading and the disturbance incident to travel by truck so irritates and excites the bees that many die of overheating and lack of ventilation. There is always the possibility of queens being killed and the combs becoming broken.

From the beekeepers standpoint he has much to lose. Besides almost certain weakening of colonies from early unpacking and examinations and overheating in transit, he runs the possibilities of acquiring disease, losses through spray poisoning, legal difficulties, and robbery and the honey acquired, except in unusual cases, will no more than equal that which he could have produced at his home apiary. Add to this the labor involved and it is not difficult to understand that the beekeeper is entitled to reasonable remuneration.

The beekeeper must keep faith with the fruit man. The fruit man can rightly demand that he gets what he pays for. Strong colonies have a greater pollinating value and therefore, a greater cash value than weaker colonies and having been paid for strong colonies it is the duty of the beekeeper to see that the orchardist gets them. An orchardist unfamiliar with beekeeping work is literally at the mercy of the beekeeper. The beekeeper must keep faith. The orchardist should deal only with competent and reputable bee men. The

foregoing statement is meant to cast no reflections on those men engaged in the beekeeping industry for as a group they are capable, trustworthy and reliable and esteem their personal and professional reputations highly.

FACTORS TO CONSIDER IN DRAWING UP A CONTRACT WHEN RENTING COLONIES

The renting of colonies of bees for orchard pollination should be carried out on a strictly business basis, as would any other business enterprise. It often happens, that men who would not think of engaging in a business venture without familiarizing themselves with all the facts relative to the case and without drawing up a formal contract, will arrange for the use of bees in a most haphazard manner. Misunderstandings sometime develop in cases where all of the details of the transaction have not been definitely determined beforehand. These misunderstandings can be avoided if the orchardist and the beekeeper will get together and draw up a legal contract which states clearly just what are to be the responsibilities of each party to the contract.

In drawing up a contract there are a number of things to be considered. It should be stipulated that only *strong* colonies be supplied. The time that colonies are to be moved in and out of an orchard should be agreed upon. The orchardist should agree to notify the beekeeper at least 48 hours in advance of the time that he wants the bees in the orchard, and the beekeeper must stand ready to supply his colonies on this short notice. (Possibly a cash penalty per colony should be stipulated in the contract for delay in moving). When 80-90% of the petals have fallen the orchardist should notify the beekeeper that the time for removal of the colonies is at hand, and the beeman must either remove his bees within 48 hours after such notification or else stand whatever loss from spray poisoning that may occur incident to the petal fall spray. With timely notification by the orchardist, and prompt moving of colonies by the beekeeper, the bees will never prove a source of annoyance to orchard workers and live stock, and there will be no danger of losses to the beekeeper from spray poisoning. By intelligent moving in and out of an orchard the colonies are never in conflict with routine orchard work. They are placed after the pre-pink spray has been applied and are removed before the application of the petal fall spray.

While there is no occasion to spray or dust during fruit bloom it should be agreed that neither spraying nor dusting will be practiced during this period.

A definite price per colony should be agreed upon, and it is always best to state in the contract how, when and where the money will be paid. This price will be determined to some extent on which party supplies the truck; who pays for the gas and oil; and who supplies the helper. Should the orchardist be in a position to supply the truck and its fuel and one of his men to assist in the loading and unloading, this value of course should be substracted from the contract price. This angle should be considered and included in the contract.

The contract should also state how the colonies are to be distributed in the orchard. It should not be left to the beekeeper to decide upon the location for each colony. He should either be met when he drives into the orchard by one in authority, or else the hive locations should be designated by stakes or some suitable markers.

Hives should be placed upon stands which will set them off the ground several inches. Stones, bricks, hollow tiles or blocks of wood answer the purpose. Beekeepers often have their colonies located on permanent non-movable hive stands at the home apiary, so it should be agreed who shall supply the temporary orchard hive stands.

Some of these details may seem trivial, but it is best to have them clearly agreed upon beforehand, as delays and sometimes unpleasant misunderstandings have resulted from overlooking them.

PRICE PER COLONY

A fair price per colony will depend upon a number of factors, previously indicated. These factors may be summed up as follows: Colony strength; transportation costs and which party pays them; who supplies the helper; distance colonies must be moved; accessibility of orchard and individual hive locations; who supplies the hive stands.

Considering the amount of work, the risks involved and the certain weakening of rented colonies, the beekeeper should not receive less than four dollars per colony, and this amount only when the orchardist supplies the truck and one of his men to help in the loading and unloading. Should the beekeeper supply the truck and his helper, five dollars is a fair price. In general, these price figures may be looked upon as standard, however, there may be factors under certain conditions which will justify a higher rental price.

BUYING BEES

Should an orchardist desire to own his colonies of bees he may start his apiary either by purchasing established colonies from a local beekeeper or else he may buy package bees from the south and hive them himself in newly purchased equipment. In either case, before buying the bees, the orchardist should determine who will be available to care for them. Neglected bees are of very little value.

There are three possibilities as to care; (1) The orchardist himself may become beekeeper; (2) one of his employees may become beekeeper; (2) one of his employees may become beekeeper; or (3) a local beekeeper may be hired to manage the apiary. It should also be determined whether or not the apiary will be managed for both honey production and pollination purposes, or for pollinating alone. Management for pollinating alone, while it calls for superior bee practice (to obtain early strong colonies) will require less time and work. This does not mean that the colonies can be neglected.

Should it be decided that the orchardist or one of his employees will care for the colonies it will be necessary that they acquire a knowledge of apiary management suitable to their particular needs. Management for pollinizing purposes alone will require less knowledge than management for pollination and honey production. Where honey is to be produced more knowledge of bee behavior and colony activities is necessary. Instruction and information regards management may be secured through the Department of Entomology, University of Maryland, College Park, Maryland.

It is often possible to secure the services of an experienced beekeeper for this work. He may either be paid on a per diem or honey crop share basis. Where the services of a competent local beekeeper can be obtained,

the arrangement is likely to prove most satisfactory. However, should the orchardist have in his employ an intelligent man who can be interested in learning the care of bees, it is a good plan to have him trained and turn the management of the apiary over to him as part of his work. This plan has proven highly satisfactory in many cases.

Another plan is to be recommended. This plan involves the cooperative buying of an adequate number of colonies by several neighboring orchardists. The colonies are placed in the care of a reliable bee man who manages the apiary and supplies strong colonies at blossom time to the orchard men. He is supplied with necessary labor at moving time and with trucks. The remuneration given the beeman is the total honey crop he is able to produce. Should he be located in a favorable honey region the profits from the large number of colonies under his management will be adequate pay for his services. He in reality has been set up in the bee business without any investment of money and his only duty to the orchard men is to supply them during fruit bloom with strong colonies.

In buying colonies it is always best to deal with an experienced beekeeper. Before colonies are purchased they should be inspected by the State Apiary Inspector for possible disease. While it is possible to buy weak colonies and build them up, it is usually the best plan to purchase only strong, populous colonies so that the full benefits will be received the first year. Colonies in boxes, barrels, "gums," or delapidated equipment should never be purchased. Only colonies housed in modern movable-frame hives that have been cared for should be purchased.

The cost of an established colony of bees will vary between wide limits, and is dependent upon the amount and condition of hive equipment included, strength of colony and amount of stored honey.

PACKAGE BEES

Within recent years a specialized form of bee business has developed in the far Southern States. This is known as the package bee business. This service now makes it possible to buy colonies of various sizes, shipped express from the south in wire cages. The bees are bought by the pound. (5,000 bees weigh approximately 1 pound). The usual size bought is the three pound package although there is some demand for 2, 4 and 5 pound sizes. Each package besides the thousands of worker bees contains one fertile queen bee. The wire cages, of course, are not suitable for permanent homes for the bees, and upon arrival they must be transferred to modern hives.*

The orchardist can make use of this package bee service in three ways. A discussion of each method follows:

Package Bees for Permanent Use

If package bees are to be purchased for permanent use it is necessary for the orchardist to buy modern movable frame hives. These hives usually are bought knocked-down. As there must be no delay in hiving these package bees, the hives should be set up and everything must be in readiness for their arrival. The permanent location for the apiary should be decided upon beforehand so that the movement into and out of the orchard will be the only moves necessary.

In buying package bees and new equipment there is no danger of starting out with a diseased condition. Arrangements must be made for the management of the apiary the same as when established colonies are purchased locally.

It is sometimes possible to buy used equipment from a local beekeeper, to house the package bees. Only under unusual conditions is this advisable because new equipment can be purchased very reasonably. Prices at the present time are unusually low. It never pays to construct one's own hives.

*Directions for transferring and the equipment necessary may be secured from the Department of Entomology, University of Maryland, College Park, Md. Prices as quoted by the beekeepers supply companies on equipment and prices as quoted by southern beekeepers on package bees, will also be furnished.

Package Bees for Temporary Use

If it should happen that the orchardist does not want to go near the bees, let alone keep them and build up an apiary, there is a plan that has proven satisfactory. The orchardist may make arrangements with a local beekeeper to supply empty hives for housing the package bees that the orchardist buys. The beekeeper for his services and use of his equipment receives the bees after the blossoming period is over.

Under this arrangement the orchardist orders the bees, pays for them and carefully arranges the exact date of delivery. He hauls the bees from the depot to the orchard and is met there by the beekeeper, who takes charge of them from then on. The beekeeper has previously set out his hives in locations designated by the orchardist, and everything is in readiness for him to hive the bees. He is responsible for their care while in the orchard. When 80-90% of the petals have fallen the orchardist notifies the beeman. From that point on the bees belong to the beeman and he moves them to his apiary.

This method requires of the orchardist only that he order, pay, make arrangements for receiving date, haul the bees to the orchard, and finally notify the beeman when to remove them. While this is an excellent plan from the standpoint of convenience (no knowledge must be gained of beekeeping, no contact with the bees need be made, no equipment is necessary), the orchardist must go to the same expense year after year.

Within the last few years a special orchard pollinizing package, containing 5 pounds of bees has been developed for temporary use, to be destroyed, bees and all, after the petals have fallen. The ordinary package usually contains only 3 pounds of bees and is not constructed in such a manner as to afford a suitable home for even the short period of fruit bloom. This new orchard package is large enough to hold 5 pounds of bees and is suitable for their shipment by express. It also has the added advantage of being so constructed that by wrapping it securely in newspapers, building paper or other suitable material, it forms an adequate temporary home for the bees during blossom time. No hive equipment is needed. When the petals have fallen, the packages are gathered at night and destroyed by burning.

SUMMARY OF RECOMMENDATION

It can be safely recommended that where strong, established colonies can be rented or developed by an orchardist they will prove more satisfactory than

package bees. Renting will prove more convenient to the orchardist than orchard package bees, but the expense will be slightly more per colony. However the rented, established colony, will send more worker bees to the field than the orchard package. It will also send out more bees on cloudy or cool days and it will send them out earlier in the morning.

Rented colonies are to be recommended when the orchardist desires no personal contact with the colonies and when strong colonies can be secured from a reliable beekeeper.

It is recommended that colonies be owned by an orchardist (starting either with established colonies purchased from a local beekeeper, or starting with package bees and new equipment) when he himself or one of his employees has the inclination and the time to study and become proficient in apiary management or when a competent beekeeper can be hired to care for them. Under these essential conditions owing one's own apiary is the best of all the plans.

Buying package bees is recommended in cases where the orchardist cannot rent strong colonies locally, does not desire to become a beekeeper himself and has no interested employee to handle them. In this case the only course left is to secure package bees.

NOTE: **The Proceedings of the 1932 Winter Meetings of the Society have been mailed to all paid-up members. If you have not received your copy write A. F. Vierheller, College Park, Md.**

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THE POLLINATION PROBLEM

L. H. McDaniels, Cornell University, Ithaca, New York.

With the planting of large commercial orchards there has been a distinct tendency to reduce the number of varieties planted and to grow these in large blocks without interplanting with other varieties. From the standpoint of orchard management such planting is doubtless of great advantage. From the standpoint of securing cross-pollination, however, it is very unfavorable and has been a frequent cause of crop failure. Another factor of importance in the changing conditions is the decrease in the number of wild insects which visit orchards at blooming time.

Only about five per cent of the blossoms on a full blossoming apple tree are necessary for a crop. It is evident therefore, that most of the blossoms are doomed to fall. The difficulty is that during the last stages of bloom and the early development of the young fruit any adverse growth condition such as shortage of water or lack of nitrate may cause too many blossoms and young fruits to be cut off and crop failure results. Cross-pollination, fertilization, and the development of the young seed are processes that are necessary for the further development of the fruit beyond the early stage and though other factors may be equally important cross-pollination is an essential step in obtaining a set of fruit that no intelligent fruit grower should ignore.

The underlying basis of the difficulties encountered in the pollination problem is in the nature of the varieties themselves either in their inability to set fruit with their own pollen, or to furnish an abundant supply of pollen for transfer in cross-pollination. Fundamentally, this is a technical problem which need not be discussed here. Practically, in considering the varieties that are grown commercially in Pennsylvania, it must be realized that Stayman, Northern Spy, Delicious, McIntosh, Paragon, Winesap and Stark are sufficiently self-sterile so that they will not set satisfactory crops without cross-pollination. The varieties Baldwin, York, Wealthy and Rome on the other hand, though setting better with cross-pollination than without it are usually not a serious problem in the orchard because they ordinarily set a crop when they bloom. The varieties King, Grimes and Jonathan are intermediate in their ability to set fruit with their own pollen. As a generalization it may well be said that all varieties will benefit by some provision for cross-pollination. With varieties that are outstandingly self-sterile, however, extraordinary provision for cross-pollination is advisable.

Just as there is variation in the ability of varieties to set fruit with their own pollen, varieties also differ in their value as sources of pollen in the orchard. Among the varieties grown in Pennsylvania we find that Delicious, Grimes, Jonathan, Northern Spy, Rome, York and McIntosh are good pollen producers and can be relied on to cross-pollinate other varieties that bloom at the same time. On the other hand Baldwin, Stayman, Winesap, Paragon, Stark and King have been shown to be of little value as sources of pollen and Smokehouse, in the trials made, has been of doubtful worth. Wealthy has given somewhat erratic results as a pollinizer and experience in Maryland has indicated that Grimes is not satisfactory for Paragon though producing good results on most other varieties. This group of poor pollen producing

Address delivered before Pennsylvania State Horticultural Association, January, 1931.

varieties may be under favorable orchard conditions of some value in cross-pollination but they should not be relied on as the only sources of pollen unless planted in rather large proportion to the variety to be pollinated.

In any commercial planting it is always a temptation to limit the number of varieties planted to the few with the best market demand. This is undoubtedly an advantage from the market standpoint but it may be decidedly disadvantageous from the standpoint of cross-pollination. Fortunately for Pennsylvania growers, the choice of varieties is not so limited with them as it is in New England or New York. In any case, in providing for cross-pollination there are a number of important considerations to be borne in mind. One of them is the necessity of using varieties for pollinizers whose blooming season is coincident with that of the variety to be pollinated. Obviously it is unwise to expect a late blooming variety like Rome to satisfactorily pollinate an early blooming sort like McIntosh. In some seasons even a mideseason bloomer like Delicious may not be satisfactory.

In growing a self-sterile variety like Stayman that is itself a poor source of pollen it is advisable to include a third variety among the pollenizers. For example, Stayman may be pollinized by Grimes but would not be effective in pollinizing Grimes so that a third variety like Jonathan would need to be included to pollinate Grimes. Having two varieties for pollinizers is also an advantage in providing for the possible alternation in blooming of one of the pollen varieties.

As an orchard problem there are two phases to be considered in providing for cross-pollination. One is the provision of the sources of pollen and the other is the distribution of that pollen between varieties. The first of these deals with the varieties that are to be planted together and the planting distances. The other includes the use of bees specifically for pollen carriers. Neither of these can be settled finally or exactly because both depend for their effectiveness upon the condition of the weather at blooming time. In Western New York there have been seasons in which the weather was so unfavorable for insect flight that pollen was not distributed even between adjacent trees. In other years, as for example, the season of 1929 in the Champlain Valley, the weather was so favorable for insect flight that adequate cross-pollination for commercial crops was secured practially everywhere even where little provision for cross-pollination had been made. Even under these favorable conditions, however, large blocks of self-sterile sorts may not be adequately cross-pollinated.

Making provision for cross-pollination both by the inclusion of pollen varieties in the orchard and making sure of a supply of bees will be found most profitable and effective in seasons that are in general unfavorable for insect flight but in which there are a few hours or perhaps a day when the insects carrying pollen can work effectively. In such seasons good crops will be harvested in orchards which have well spaced pollinizers and bees scattered throughout the planting whereas orchards in solid blocks will have almost total crop failure. It is, of course, impossible to give the definite distance at which pollinizers should be placed so as to be satisfactory under all conditions. There is frequent observation to show, however, that in seasons with only a few hours of favorable weather the set of fruit begins to fall off in the second row distant from the pollinizer trees. To secure satisfactory pollination in such seasons, therefore, not more than 2 or 3 rows of a variety like McIntosh or Stayman should be planted between rows of pollinizers. In planning a

new orchard, a satisfactory plan would be to set 2 or 3 rows of McIntosh to each pollinizer row. Every third tree in the pollinzer row should be an early blooming variety such as Oldenburg. Between these a mid-season blooming variety such as Wealthy might be planted. This scheme would of course be varied with different varieties to suit conditions.

In top-working trees in a solid block of McIntosh or Stayman for pollination purposes, every third tree in every third row would be a minimum number of pollinizers. Preferably two-thirds of the trees in the pollinizer row might be top-worked using two varieties as outlined above.

Bringing bees into the orchard at blooming time for pollination purposes is a practice which is receiving increasing attention in all the northern fruit growing sections. Whether or not the grower will find it to his advantage to bring in bees is a more or less individual problem. In an isolated orchard with considerable waste land near there is probably little necessity for bringing in bees at blooming time because of the abundance of wild insects. In Western New York, however, the bee population is so small that unless the weather is exceptionally favorable the supply of pollen carriers is wholly inadequate. To be most effective, bees used for cross-pollination should be given special care in wintering and should be placed in the orchard at the rate of one strong colony to each two acres. If a season is unfavorable for insect flight bees will work to some extent in the orchard when they would not venture across open fields. In using bees it must be remembered that they have decided limitations. The body temperature of the bee, so the bee men tell us, must be at least 57° F. before it is possible for them to be at all active. Under otherwise favorable conditions they will fly rather sparingly at from 62 to 65° F. but need temperatures of nearly 70° for full flight. It can thus be seen that the activity of the bees is limited by the weather. Often in poor seasons bringing bees into the orchard would have little effect. In extra good seasons the chances are that wild insects or the neighbors' bees will be effective. It is in seasons when there is only a short period of good weather favorable for insect flight that bees in the orchard are most valuable.

As a temporary expedient to furnish sources of pollen in the orchard during the time that the grafts of pollen varieties are coming into bearing the use of "bouquets" may be of value. By "bouquets" are meant blossoming branches of pollen varieties which are placed in containers of water near the trees to be pollinated. In general the larger the bouquets the more satisfactory will be the pollen transfer. Experiments have shown rather conclusively that the most effective placing of bouquets is not near the hives of bees but near the varieties to be pollinated. Suspending pails in the trees and filling these with good sized blossoming branches is an effective method. If large limbs can be secured, placing them out in the open in the square between four trees has given good results. In this case it is necessary to tie the blossoming branches to a stake to keep them from falling over. Another relatively quick and satisfactory way to use bouquets is to place the water container on the ground underneath the outer spread of the branches. If large limbs of the pollen variety, for example 2 or 3 inches in diameter are available the end of the branch can be placed in the water of the container and the top of the branch forced into the tree to be pollinated. This obviates the necessity of tying.

It would be unfair to leave this subject without mentioning the possibility of the disadvantage of over-pollination. Orchards which are abundantly

varieties may be under favorable orchard conditions of some value in cross-pollination but they should not be relied on as the only sources of pollen unless planted in rather large proportion to the variety to be pollinated.

In any commercial planting it is always a temptation to limit the number of varieties planted to the few with the best market demand. This is undoubtedly an advantage from the market standpoint but it may be decidedly disadvantageous from the standpoint of cross-pollination. Fortunately for Pennsylvania growers, the choice of varieties is not so limited with them as it is in New England or New York. In any case, in providing for cross-pollination there are a number of important considerations to be borne in mind. One of them is the necessity of using varieties for pollinizers whose blooming season is coincident with that of the variety to be pollinated. Obviously it is unwise to expect a late blooming variety like Rome to satisfactorily pollinate an early blooming sort like McIntosh. In some seasons even a mideseason bloomer like Delicious may not be satisfactory.

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As an orchard problem there are two phases to be considered in providing for cross-pollination. One is the provision of the sources of pollen and the other is the distribution of that pollen between varieties. The first of these deals with the varieties that are to be planted together and the planting distances. The other includes the use of bees specifically for pollen carriers. Neither of these can be settled finally or exactly because both depend for their effectiveness upon the condition of the weather at blooming time. In Western New York there have been seasons in which the weather was so unfavorable for insect flight that pollen was not distributed even between adjacent trees. In other years, as for example, the season of 1929 in the Champlain Valley, the weather was so favorable for insect flight that adequate cross-pollination for commercial crops was secured practially everywhere even where little provision for cross-pollination had been made. Even under these favorable conditions, however, large blocks of self-sterile sorts may not be adequately cross-pollinated.

Making provision for cross-pollination both by the inclusion of pollen varieties in the orchard and making sure of a supply of bees will be found most profitable and effective in seasons that are in general unfavorable for insect flight but in which there are a few hours or perhaps a day when the insects carrying pollen can work effectively. In such seasons good crops will be harvested in orchards which have well spaced pollinizers and bees scattered throughout the planting whereas orchards in solid blocks will have almost total crop failure. It is, of course, impossible to give the definite distance at which pollinizers should be placed so as to be satisfactory under all conditions. There is frequent observation to show, however, that in seasons with only a few hours of favorable weather the set of fruit begins to fall off in the second row distant from the pollinizer trees. To secure satisfactory pollination in such seasons, therefore, not more than 2 or 3 rows of a variety like McIntosh or Stayman should be planted between rows of pollinizers. In planning a

new orchard, a satisfactory plan would be to set 2 or 3 rows of McIntosh to each pollinizer row. Every third tree in the pollinzer row should be an early blooming variety such as Oldenburg. Between these a mid-season blooming variety such as Wealthy might be planted. This scheme would of course be varied with different varieties to suit conditions.

In top-working trees in a solid block of McIntosh or Stayman for pollination purposes, every third tree in every third row would be a minimum number of pollinizers. Preferably two-thirds of the trees in the pollinizer row might be top-worked using two varieties as outlined above.

Bringing bees into the orchard at blooming time for pollination purposes is a practice which is receiving increasing attention in all the northern fruit growing sections. Whether or not the grower will find it to his advantage to bring in bees is a more or less individual problem. In an isolated orchard with considerable waste land near there is probably little necessity for bringing in bees at blooming time because of the abundance of wild insects. In Western New York, however, the bee population is so small that unless the weather is exceptionally favorable the supply of pollen carriers is wholly inadequate. To be most effective, bees used for cross-pollination should be given special care in wintering and should be placed in the orchard at the rate of one strong colony to each two acres. If a season is unfavorable for insect flight bees will work to some extent in the orchard when they would not venture across open fields. In using bees it must be remembered that they have decided limitations. The body temperature of the bee, so the bee men tell us, must be at least 57° F. before it is possible for them to be at all active. Under otherwise favorable conditions they will fly rather sparingly at from 62 to 65° F. but need temperatures of nearly 70° for full flight. It can thus be seen that the activity of the bees is limited by the weather. Often in poor seasons bringing bees into the orchard would have little effect. In extra good seasons the chances are that wild insects or the neighbors' bees will be effective. It is in seasons when there is only a short period of good weather favorable for insect flight that bees in the orchard are most valuable.

As a temporary expedient to furnish sources of pollen in the orchard during the time that the grafts of pollen varieties are coming into bearing the use of "bouquets" may be of value. By "bouquets" are meant blossoming branches of pollen varieties which are placed in containers of water near the trees to be pollinated. In general the larger the bouquets the more satisfactory will be the pollen transfer. Experiments have shown rather conclusively that the most effective placing of bouquets is not near the hives of bees but near the varieties to be pollinated. Suspending pails in the trees and filling these with good sized blossoming branches is an effective method. If large limbs can be secured, placing them out in the open in the square between four trees has given good results. In this case it is necessary to tie the blossoming branches to a stake to keep them from falling over. Another relatively quick and satisfactory way to use bouquets is to place the water container on the ground underneath the outer spread of the branches. If large limbs of the pollen variety, for example 2 or 3 inches in diameter are available the end of the branch can be placed in the water of the container and the top of the branch forced into the tree to be pollinated. This obviates the necessity of tying.

It would be unfair to leave this subject without mentioning the possibility of the disadvantage of over-pollination. Orchards which are abundantly

supplied with pollinizers in a season favorable for insect flight may have so many fruits set that unless careful thinning is done early in the season the size of the fruits borne will be small and the trees thrown out of bearing for the following year. In some years an extra heavy early set due to over pollination may actually result in such a heavy June drop that the crop would be smaller than it would have been had fewer blossoms have pollinated. As the problem appears to me now, however, it is much more sensible to provide for pollination in the years of poor weather and to endeavor to control the size of fruit and possible alternation in bearing by other means.

The grower who is managing his business intelligently will adopt the best practice he can find with regard to pruning, spraying and culture and in addition make such provision for cross-pollination as seems expedient under his conditions. After this is done, obtaining a set of fruit is a matter largely beyond his control.

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PITTSBURGH, PENNSYLVANIA

A Frank Talk on Codling Moth Control

By B. G. Pratt

Codling moth is gaining ground in the East in spite of heavier and a larger number of poison sprays, necessitating the washing of fruit to remove spray residue. We have counted 29 and 30 stings on apples whitewashed with arsenate of lead.

During the past 21 years, we have planted 20,000 apple trees and had 3,000 old trees leased for 11 years. We have never considered codling moth an economic factor—the worst infection not exceeding 2% in badly infested districts. In 1931, we had no more than ½ of 1% in either the older or younger orchards.

We have always followed our regular spray program of not over 4 poison sprays of 2 pounds to the hundred gallons. This year, 14 cars of our apples were exported, within arsenate tolerance, without even brushing.

We did not consider that our spray program was any more effective than others against codling moth until it was forced on our attention. One grower who tried two rows each of Bens and Jonathans right through his orchard wrote, "They have fewer worms by far than the other fruit with the same number of sprays of lime sulfur and bordeaux sprays."

Another grower who tried our complete spray program on his Golden Delicious orchard writes, "Clean as a pin, slick and waxy and not a wormy apple."

A Georgia grower who brought up his hundred acre orchard on our sprays writes, "It is worthy to note that we had no codling moth; every other orchard in this State is more or less infested."

If you have not solved the codling moth and spray residue question, don't you think our spray program worthy of a trial?

It costs no more, if as much, as other sprays.

"A postal card to me in care of B. G. Pratt Company, Department F, 50 Church Street, New York City, will bring you this Apple Spray Program in greatest detail. You will not be placed under any obligation."